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DEPARTMENT OF DEFENSE
DEFENSE ATOMIC SUPPORT AGENCY
WASHINGTON 25, D.C.

ADDRESS REPLY TO:
THE CHIEF, DEFENSE ATOMIC
SUPPORT AGENCY

15 May 1962

MEMORANDUM FOR: SECRETARY OF DEFENSE

SUBJECT: Program Change Proposal for DASA

1. Inclosed is the initial Program Change for DASA as provided for by DOD Directive 7045.1, "Program Change Control System," 12 April 1962.

2. The new program element listing which is effective 1 June 1962 provides for six DASA Program Elements. Previously, all missions and tasks were combined in one program element with a separate distinction made for significant areas of responsibilities. This submission is a replacement of previously submitted material and provides changes to the current DASA Element and at the same time develops a base for the new program elements.

3. This solution to the problem of converting to the new program structure was discussed with representatives of the ASD Comptroller (Programming) and concurred in by them.

4. Due to the sensitivity of the contents of this document it is requested that the distribution be controlled and only those persons with a valid need-to-know be afforded access.

Robert H. Booth

1 Incl
DD Form 1355-2
w/attachments

ROBERT H. BOOTH
Major General, USA
Chief

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I N D E X

PROGRAM CHANGE FORCES, INVESTMENT, OPERATIONS	SUBMITTING DOD COMPONENT: DASA	CHANGE NUMBER: 7 60 XX 01 5 #1
DATE LAST PREV SUBM.: 15 April 1962	PROCURING DOD COMPONENT: N/A	
[X] PROGRAM ELEMENT [ ] ITEM: Defense Atomic Support Agency	PRESENT AND/OR PROPOSED USERS: DOD, JCS, Army, Navy, Air Force	

ULTIMATE PROGRAM OBJECTIVES: DASA conducts joint atomic weapons technical operations for the Department of Defense, administers the Defense portion of joint DOD/AEC effort in the control of the national stockpile of atomic weapons, and processes atomic weapon requirements in numbers and military characteristics through development, production, distribution, maintenance, modernization, and replacement in the national stockpile. DASA conducts technical training, performs technical inspections of deployed atomic capable units, develops and administers storage criteria and operational safety measures; and provides over-all surveillance, coordination, advice and assistance on major actions affecting the atomic weapons stockpile. It operates a Field Command, the Sandia Base, and the National Stockpile Sites. DASA also conducts the joint program for research in nuclear weapons effects, and plans for and includes DOD participation in nuclear weapons effects tests of primary concern to the Armed Forces and the weapons effects phases of developmental or other tests of nuclear weapons.

BASIS FOR CHANGE

To revise the original 31 Aug 61 submission to reflect resumption of full scale testing and other internal changes within DASA and to provide a basis for the new DASA Elements which will be effective 15 June 1962. Previous changes to the original submission were made against DASA totals and not against the new elements which will apply. This proposal incorporates previously approved changes in the new elements and provides for adjustment to 15 April 1962 totals appearing in the "Five-Year Force Structure and Financial Program."

RESEARCH AND DEVELOPMENT STATUS

(Millions of Dollars)

Proposed Status:	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
Nuclear Weapons Development	1.5	1.4	1.4	1.1	1.0	1.0
Nuclear Weapons Effects Research	30.0	55.3	52.6	47.2	46.1	43.9
Nuclear Weapons Effects Tests	100.0	104.0	107.0	112.0	98.6	56.0
Damage Assessment	14.1	6.2	7.2	6.3	6.3	6.3
TOTAL	145.6	166.9	168.2	166.6	152.0	107.2
15 April 1962 Approved Amount	133.5	135.0	125.0	100.0	100.0	N/A
Proposed Adjustment	12.1	31.9	43.2	66.6	52.0	N/A

12.9 - AMCC
19.2 = DOD-DASA

FACILITIES REQUIREMENTS AND AVAILABILITY: Military Construction proposed replaces or modifies present facilities.

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PROGRAM CHANGE - FORCES, INVESTMENT, OPERATIONS *(Continued)*

PROCUREMENT AND DELIVERY/COMPLETION SCHEDULE

FUNDING YEAR - FY	DELIVERY - FY								
									TOTALS
		NOT APPLICABLE							
TOTALS									

COST SUMMARY *(TOA in $ millions)*	ORIGINAL	LATEST APPROVED	PROPOSED
RESEARCH AND DEVELOPMENT COSTS:			
FY 1962 AND PRIOR	50.4	133.8	141.9 /1
FY 1963 *(Current Year)*	138.7	133.5	145.6
FY 1964 *(Budget Year)*	103.9	135.0	166.9
TO COMPLETE			
TOTALS	293.0	402.3	454.4
INVESTMENT COSTS:			
FY 1962 AND PRIOR	1.3	.8	.8
FY 1963 *(Current Year)*	2.2	2.2	2.2
FY 1964 *(Budget Year)*	.1	.1	3.7
TO COMPLETE			
TOTALS	3.6	3.1	6.7
ANNUAL OPERATING COSTS:			
FY 1963 *(Current Year)*	50.7	46.1	53.6
FY 1964 *(Budget Year)*	51.9	50.7	59.2
LEVEL-OFF ANNUAL OPERATING COST (BY_____)			
FORCE LEVEL/ITEM ACQUISITION OBJECTIVES N/A			
FIRST LINE LIFE N/A			

/1 $8.1 million Emergency Fund request in process

EXPLAIN CHANGES IN PHASING OR COSTS

SEE ATTACHED SUMMARY FOR DETAILS

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PROGRAM CHANGE - FORCES, INVESTMENT, OPERATIONS (Continued)

IF PHASE-OUT, INDICATE TOTAL SAVINGS FROM PREVIOUSLY APPROVED PROGRAM

[redacted]

NOT APPLICABLE

IMPLICATIONS FOR OTHER PROGRAM ELEMENTS/ITEMS

NOT APPLICABLE

MANPOWER REQUIREMENT AND AVAILABILITY

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68	FY 69	FY 70	FY 71
15 April 1962 Approval	7930	7930	7930	7930	7930	7930	7930	7930	7930
Augment DODDAC	163	203	258	267	272	272	272	272	272
Augment JTF-8	118	118	118	118	118	118	118	118	118
	8211	8251	8306	8315	8320	8320	8320	8320	8320

APPROVAL SPECIFICALLY REQUESTED FOR

1. Nuclear Weapons Effects Research and Tests at the levels proposed for each year.
2. Assign DASA responsibility for support of the NMCC; provide funds and personnel at the level proposed for Fiscal Year 1963 and thereafter.
3. Authorize a permanent JTF-8 Headquarters Staff of 250.
4. Adjust military personnel costs to reflect more accurate data.
5. Adjust costs of other elements to reflect refinement of previous estimates.

FINANCING IN CURRENT AND BUDGET FISCAL YEARS

	Fiscal Year 1963	Fiscal Year 1964
Research, Development, Test & Evaluation	$145.6 /1	$166.9
Military Construction	2.2	3.0
Procurement	1.7	4.3
Operation & Maintenance	22.6 /1	26.1
Military Personnel	29.3	29.5
	$201.4 /1	$229.8

/1 DASA Budget provides for $133.5(RDT&E) and $21.2(O&M)

DATE	SUBMITTING DOD COMPONENT (Signature)
15 May 1962	Robert H. Booth [redacted]A

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Section 1

S U M M A R Y

Memorandum from the Secretary of Defense (Comptroller) dated 28 April 1962 provided a revised program element listing for DASA. Description of these elements, together with the approved 15 April 1962 totals, converted to the new element structure is provided. Proposed changes to these totals are also provided.

a. NUCLEAR WEAPONS OPERATIONS AND TRAINING (7 60 02 01 5)

Operates the National Stockpile Sites, maintains the status of all U.S. bombs and warheads, and assists the JCS in determining quantitative requirements for atomic weapons and in preparing plans for their dispersal and distribution. Operates an industrial type facility for modifying, modernizing and preparing for retirement atomic weapons in the stockpile. Consolidates Service and DASA requirements for training weapons, equipment, spare parts, and other non-fissionable atomic weapons material, and procures them from the AEC. Develops technical standards and conducts technical inspections to insure that these standards are met by forces authorized atomic weapons. Training is provided. This includes training of Army and Marine Corps units, as well as assisting the Services in the conduct of their own nuclear weapons training.

TOA Approved 15 April 1962
(Millions of Dollars)

	FY 63	FY 64	FY 65	FY 66	FY 67
MILCON	1.2	.1	.1	.2	2.5
PROCUREMENT	1.7	4.3	4.5	2.8	4.8
O&M	15.8	17.4	16.9	17.4	17.6
MIL PERS.	17.3	17.3	17.4	17.5	17.5
	36.0	39.1	38.9	37.9	42.4

TOA Proposed

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
MILCON	1.2	1.6	3.2	1.1	.7	.7
PROCUREMENT	1.7	3.6	3.4	6.3	4.4	3.7
O&M	15.8	15.8	16.0	16.0	16.1	15.9
MIL PERS.	19.1	19.1	19.1	19.1	19.1	19.1
	37.8	40.1	41.7	42.5	40.3	39.4

b. NUCLEAR WEAPONS DEVELOPMENT (7 60 04 01 5)

Acts as the central coordinating agent of DOD functions in determining qualitative requirements for nuclear weapons and provides a centralized contact with the AEC on matters pertaining to qualitative requirements in research, development, production, modification, modernization and retirement of nuclear weapons, together with review of AEC schedules to insure conformance with DOD requirements. This includes establishment of military characteristics used in developing design specifications, as well as evaluating the end product to assure that DOD requirements are met. Provides coordination of the DOD portion of the Joint AEC/DOD Nuclear Weapons Vulnerability Program.

TOA Approved 15 April 1962
(Millions of Dollars)

	FY 63	FY 64	FY 65	FY 66	FY 67
RDT&E	1.5	1.2	1.2	1.0	.9
O&M	.2	.2	.2	.2	.3
MIL PERS.	.6	.6	.6	.6	.6
	2.3	2.0	2.0	1.8	1.8

TOA Proposed

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
RDT&E	1.5	1.4	1.4	1.1	1.0	1.0
O&M	.2	.2	.2	.2	.2	.2
MIL PERS.	.9	.9	.9	.9	.9	.9
	2.6	2.5	2.5	2.2	2.1	2.1

c. NUCLEAR WEAPONS EFFECTS RESEARCH (7 60 06 01 5)

Administers research concerned with obtaining new information on phenomena and effects of nuclear explosions in any environment, and the response, protection and recovery of representative targets and weapons, including personnel.

TOA Approved 15 April 1962
(Millions of Dollars)

	FY 63	FY 64	FY 65	FY 66	FY 67
RDT&E	30.0	50.8	45.7	41.0	40.7
MILCON	1.0	-	-	-	-
O&M	.2	.2	.2	.2	.2
MIL PERS.	1.0	1.0	1.0	1.0	1.0
	32.2	52.0	46.9	42.2	41.9

TOA Proposed

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
RDT&E	30.0	55.3	52.6	47.2	46.1	43.9
MILCON	1.0	1.2	.2	.8	.5	.3
O&M	.2	.3	.3	.3	.3	.3
MIL PERS.	.9	.9	.9	.9	.9	.9
	32.1	57.7	54.0	49.2	47.8	45.4

d. NUCLEAR WEAPONS EFFECTS TESTS (7 60 08 01 5)

Plans for the military phase of testing, and budgets for those items not normally included in Service Budgets; proposes the composition and control of the organization to conduct the tests and conducts phases of tests of interest to DOD; collects, assesses and disseminates effects information obtained from these tests.

TOA Approved 15 April 1962
(Millions of Dollars)

	FY 63	FY 64	FY 65	FY 66	FY 67
RDT&E	100.0	81.1	76.2	56.1	56.5
O&M	.2	.2	.2	.2	.2
MIL PERS.	1.0	1.0	1.0	1.0	1.0
	101.2	82.3	77.4	57.3	57.5

TOA Proposed

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
RDT&E	100.0	104.0	107.0	112.0	98.6	56.0
O&M	.2	.2	.2	.2	.2	.2
MIL PERS.	3.5	3.5	3.5	3.5	3.5	3.5
	103.7	107.7	110.7	115.7	102.3	59.7

e. DAMAGE ASSESSMENT (7 60 10 01 5)

Operates the DOD Damage Assessment Center, a computer-supported operation which provides (a) pre-attack appraisals of hazards to, and vulnerabilities of, military forces and economic resources of the United States, our allies, and the enemy; (b) post-attack assessment of damage to military forces and economic resources worldwide resulting from the employment of nuclear weapons; and (c) technical and computational support of joint war gaming.

TOA Approved 15 April 1962
(Millions of Dollars)

	FY 63	FY 64	FY 65	FY 66	FY 67
RDT&E	2.0	1.9	1.9	1.9	1.9
O&M	1.7	1.8	2.0	2.0	2.0
MIL PERS.	.5	.5	.5	.5	.5
	4.2	4.2	4.4	4.4	4.4

TOA Proposed

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
RDT&E	14.1	6.2	7.2	6.3	6.3	6.3
MILCON	-	.2	-	-	-	-
PROCUREMENT	-	.7	-	.3	-	-
O&M	3.1	6.4	6.7	7.1	6.9	6.9
MIL PERS.	1.5	1.7	1.9	2.0	2.0	2.0
	18.7	15.2	15.8	15.7	15.2	15.2

f. COMMAND SUPPORT (7 60 20 01 5)

Maintains a headquarters in Washington and a Field Command at Sandia Base.

TOA Approved 15 April 1962
(Millions of Dollars)

	FY 63	FY 64	FY 65	FY 66	FY 67
O&M	3.1	3.3	3.3	3.3	3.3
MIL PERS.	2.8	2.9	2.9	2.9	2.9
	5.9	6.2	6.2	6.2	6.2

TOA Proposed

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
O&M	3.1	3.2	3.2	3.1	3.1	3.2
MIL PERS.	3.4	3.4	3.4	3.4	3.4	3.4
	6.5	6.6	6.6	6.5	6.5	6.6

Discussion of the new requirements for Nuclear Weapons Effects Research and Nuclear Weapons Effects Tests is provided in a separate Section 2. DASA's proposal to support the National Military Control Center and the additional costs involved is provided in Section 3. The results of adjusting projected manpower costs to reflect refinement of costs developed by the Services, together with augmentation of JTF-8 and DODDAC are included in Section 3. Cost projections by Program Element are summarized by Fiscal Year in Section 4.

Section 2

NUCLEAR WEAPONS RESEARCH AND TESTS

1. Nuclear Weapons Effects Research (NWER) and Nuclear Weapons Effects Tests (NWET) program elements complement each other in a coordinated effort to obtain essential defense information in the field of nuclear weapons effects. The same project level research description is used in both program elements. The task and subtask organization of NWER, a laboratory program, is conceived in fiscal year time blocks. The NWET program is organized by project, task and subtask under code names of the full scale Test series, and Events in the series. The present projection assumes a test program every year through the five year outlook. Since code names will not be assigned until the NWET program is elaborated each year, the tests are reported in our projections here by short description.

2. The total requirements for effects information were considered in arriving at the NWER and NWET programs, with the best balance for rapid progress at least cost sought between the two. If the opportunity for full scale testing is eliminated at any time, it will be necessary to increase the subsequent level of NWER effort since this will be the remaining method by which progress can be continued.

3. A fund summary of the total Nuclear Weapons Effects requirement is as follows:

		(Millions of Dollars)						
Projects		FY 63	FY 64	FY 65	FY 66	FY 67	FY 68	Total
1. Air Blast	A NWER	1.7	3.3	3.0	2.0	1.1	1.1	12.2
	B NWET	14.5	6.6	18.2	7.3	6.2	6.0	58.8
	Total	16.2	9.9	21.2	9.3	7.3	7.1	71.0
2. Nuclear Radiation	A NWER	5.8	10.5	10.1	9.5	9.3	9.1	54.3
	B NWET	7.9	8.4	6.8	7.6	7.3	4.7	42.7
	Total	13.7	18.9	16.9	17.1	16.6	13.8	97.0
3. Underground	A NWER	5.4	8.9	7.8	6.1	5.7	4.7	38.6
	B NWET	1.0	8.5	1.5	4.5	7.0	2.0	24.5
	Total	6.4	17.4	9.3	10.6	12.7	6.7	63.1
4. Biomedical	A NWER	4.1	4.9	5.3	5.4	5.6	6.3	31.6
	B NWET	1.4	1.0	-	-	-	.3	2.7
	Total	5.5	5.9	5.3	5.4	5.6	6.6	34.3
5. Underwater	A NWER	2.9	3.6	3.0	2.7	2.4	2.2	16.8
	B NWET	4.7	2.0	11.0	-	6.0	-	23.7
	Total	7.6	5.6	14.0	2.7	8.4	2.2	40.5

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Projects		(Millions of Dollars) FY 63	FY 64	FY 65	FY 66	FY 67	FY 68	Total
6. Electromagnetic	A NWER	5.8	15.1	14.0	13.4	14.5	13.0	75.8
	B NWET	9.1	10.6	3.0	6.7	7.3	4.0	40.7
	Total	14.9	25.7	17.0	20.1	21.8	17.0	116.5
7. Fallout	A NWER	1.1	2.0	1.9	1.6	1.5	1.5	9.6
	B NWET	2.8	4.9	4.5	2.4	4.0	-	18.6
	Total	3.9	6.9	6.4	4.0	5.5	1.5	28.2
8. Thermal	A NWER	2.7	6.0	6.5	5.5	5.0	5.0	30.7
	B NWET	12.2	9.6	14.5	4.5	13.5	6.0	60.3
	Total	14.9	15.6	21.0	10.0	18.5	11.0	91.0
9. Integrated Effects & Phenomena	A NWER	.5	1.0	1.0	1.0	1.0	1.0	5.5
9.1 Technical Support	B NWET	25.9	28.4	20.5	52.0	23.3	12.0	162.1
TOTAL TECHNICAL PROGRAM	A NWER	30.0	55.3	52.6	47.2	46.1	43.9	275.1
	B NWET	79.5	80.0	80.0	85.0	74.6	35.0	434.1
		109.5	135.3	132.6	132.2	120.7	78.9	709.2
Extra Military Expenses of Nuclear Tests		20.5	24.0	27.0	27.0	24.0	21.0	143.5
		130.0	159.3	159.6	159.2	144.7	99.9	852.7

4. Other Defense Appropriations support the research and test effort. These include Operation and Maintenance, Military Construction and Military Personnel.

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68	Total
RDT&E	130.0	159.3	159.6	159.2	144.7	99.9	852.7
Operation & Maintenance	.4	.5	.5	.5	.5	.5	2.9
Military Construction	1.0	1.2	.2	.8	.5	.3	4.0
TOTAL APPROPRIATION FOR DASA	131.4	161.0	160.3	160.5	145.7	100.7	859.6
Military Personnel	4.4	4.4	4.4	4.4	4.4	4.4	26.4
TOTAL EFFORT	135.8	165.4	164.7	164.9	150.1	105.1	886.0

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5. The Services provide support during tests overseas. The Normal Military Expenses of this support are included in service budgets without regard to participation in a specific test. These are estimated to be:

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
Army	3.8	4.5	5.6	6.5	3.9	3.3
Navy	22.6	32.5	40.9	47.4	28.6	24.0
Air Force	12.6	19.7	24.8	28.7	17.3	14.6
TOTAL	39.0	56.7	71.3	82.6	49.8	41.9

6. There are nine projects which cover the fields of basic phenomena and response of personnel and material to nuclear explosions in all environments. The research description of these projects is published in Part III, DASA CMAS (DASA Circular 20-1) and is not reproduced here. Following are comments about each project area in the present program projection:

a. AIR BLAST. A considerable amount of data has been collected from nuclear tests and simulation experiments to round out a fairly comprehensive knowledge of air blast phenomena in the pressure range from 1 to 300 psi for surface and near surface bursts. Unfortunately, certain important areas of interest are not satisfactorily documented due to the inability of test instrumentation to measure adequately in regions of higher pressure and dust laden air flows above the surface as well as the inability to extrapolate to unusual burst conditions. Operational concepts of the Services have placed new emphasis on the safe employment of weapons and weapons systems over a wide yield range in various tactical environments as well as their vulnerability to blast effects. Of particular importance is the loading and response of re-entry vehicles during the terminal phase and other aerospace vehicles while in flight. Especially critical is the inability to predict the blast wave interaction with the shock wave generated by the re-entry vehicle and the resulting blast imposed loads. Coupled with this inadequacy is our lack of data above approximately 100,000 feet altitude. Since it appears that blast is a significant kill mechanism against re-entry and other high altitude aerospace vehicles plus a controlling vulnerability consideration in the design and hardening of our own re-entry systems in the altitude range up to at least 200,000 feet, the air blast phenomena in this region must be clearly defined. The air blast phenomena area requires investigation not only at co-altitude and above the burst point but also along rays directed at the earth's surface. The problems of blast effects below a high altitude burst gains much importance under the concept of large yield nuclear bursts at high altitude.

The greater emphasis of the five year NWER Program represented by about third the proposed funding level, is placed in theoretical and experimental studies of the loading and response of in-flight re-entry

systems. Studies of the loading and response of missiles in the launch configuration and blast effects on radar and communication systems are planned at a somewhat lower level of emphasis.

The NWER Program is based on the consideration of continued full scale testing in the atmosphere during which damage data on representative targets can be obtained. In addition, several shots are proposed to define high altitude blast phenomena. This full scale experimental information will be connected with supporting laboratory and analytical research in order to extend the current knowledge of nuclear blast effects in various targets over a wide yield range for a number of environmental situations. Research Objectives include:

(1) Determine the loading and response of re-entry vehicles and advanced aerospace systems when subjected to a nuclear blast wave while in flight. Both lethality and vulnerability will be investigated to determine critical ranges and delivery capability as a function of altitude.

(2) Determine free air blast phenomena for nuclear detonations up to 200,000 ft. as a function of altitude, yield and weapon design and the subsequent propagation of the blast wave through a non-homogeneous atmosphere to the earth's surface.

(3) Determine the vulnerability of existing types of radar and communication antennae to air blast loading and promote increased blast resistant designs through a better definition of the loading, response and mechanism of failure.

(4) Determine the vulnerability of missiles and ground support equipment in a launch or transportable configuration to air blast.

(5) Determine free field blast pheomena along the surface in the high pressure regions and for unusual burst conditions such as over Arctic terrain and forested areas.

b. NUCLEAR RADIATION. The nuclear environment resulting from a nuclear detonation may cause serious consequences for the military systems which will be required to operate in this environment. While our understanding of the diverse phenomena associated with nuclear radiations has increased rapidly during the few years that the problem has existed, it remains a subject of major military concern both from the standpoint of known effects and the possibility of yet unrealized consequences. Ready examples of this concern are our continuing efforts to effectively shield an otherwise protected man from death by nuclear radiation and our recent realization of the vulnerability of electronic systems to transient radiations.

This project therefore provides for theoretical, analytical, and laboratory studies of nuclear radiations on the ground, in the air and in the upper atmosphere. This includes the transport and measurement of these radiations and their effects on materials; penetration of nuclear radiation through shields and radiations produced from induced processes; effects of the transient radiation environment and electromagnetic pulses on electronic materials and the establishment of parameters for use in hardening electronic systems. This wide field of military interest has been broken down into three tasks as follows: Initial Nuclear Radiation Measurements, Shielding, and Transient Radiation Effects on Electronics. Each task is discussed in more detail below:

(1) Initial Nuclear Radiation Measurements. As a supplement to full scale testing, laboratory, experimental and theoretical programs directed towards a better understanding of the effects of initial nuclear radiation must be undertaken in order to: (1) make maximum use of data taken at past and future field tests; (2) extend present knowledge so that the development of future weapons systems may proceed at an orderly and uninterrupted pace; (3) improve our present capability to predict radiation effects on materials; and (4) improve means and techniques of measuring the radiation environment in order that one may insure the reliable operation of systems required to function in a radiation environment as well as, conversely, to define the kill environment for enemy systems.

This task includes the development of suitable instrumentation to measure these radiations at simulation facilities or at weapons tests, the determination of the effects on materials exposed to these radiations, and studies of the transport of initial gamma and neutron radiation.

Research objectives include:

(a) Source Phenomenology. This includes an understanding of the mechanisms involved in the production and life of neutrons and gamma photons during a nuclear detonation. For neutrons this includes a determination of the number and energy spectrum as a function of time at the case.

(b) Effects on Materials. This includes the experimental determination and development of theoretical techniques to explain effects on materials which are caused by exposure to nuclear radiations (not to include electronics, shielding, or biological specimens).

(c) Instrumentation. This includes development of the instrumentation and techniques required to determine the neutron and gamma environment at nuclear detonations and radiation simulation facilities.

(d) Transport. This includes the calculation and determination of the transport of initial nuclear radiation from the source to the detector.

(2) Shielding. The degree of flexibility afforded our troops in battlefield operations requiring exposure to nuclear detonations is directly dependent upon our ability to attenuate mixed radiation fields with shields. On the home front, our protective shelters for both the civil populace and military facilities are no better than our present ability to analyze the protective properties of existing shelters and formulate design modifications for their improvements.

Research objectives include:

(a) Basic Studies. This provides for the formulation of calculational methods of radiation penetration and development of engineering; technologies to include extension of moment methods, Monte Carlo and other computer techniques; determination of neutron cross sections, and fundamental experimentation of such problems as albedo, openings, ducts, mazes, and other boundary conditions.

(b) Engineering Applications. This provides for the extension and application of all shielding technology to simple and complex geometries encountered in underground and above ground structures, ships, ordnance vehicles and field fortifications.

(c) Induced Activity. This objective is to develop the calculational techniques, experimental determinations, and predictions of dose rates resulting from activity caused by bomb neutron interactions in soil.

(3) Transient Radiation Effects on Electronics. Many military electronic systems may malfunction when exposed to the electromagnetic pulses or transient nuclear radiations generated by nuclear detonations. Field tests conducted at Operation HARDTACK confirmed the vulnerability of electronics to bomb generated transient radiation. The data obtained in that operation, however, did little more than expose the problem. The vulnerability of electronics to transient radiation and electromagnetic pulse effects has a direct impact upon our guided missile and satellite development programs. Launch site communications and circuitry will be subjected to severe electromagnetic pulse effects and missile and satellite systems must survive transient radiation environments to accomplish their missions.

TREE research is required to define and investigate the problems associated with exposure of electronic systems to weapon generated electromagnetic pulses and transient radiation environments and to develop information required for reducing the vulnerability of military electronic systems.

Research objectives include:

(a) Develop transient radiation simulation devices and techniques to correlate response of electronics in laboratory environments to response in weapon environments.

(b) Determine fundamental transient radiation and electromagnetic pulse effects on electronic materials, components and simple circuits.

(c) Develop reliable analytical techniques for prediction and evaluation of responses of complicated circuits and sub-systems to weapon generated electromagnetic pulses and transient radiation environments.

c. UNDERGROUND. The major requirement for research information related to protective structures, hardened missile sites, and command centers is a clear definition of the environment produced by large surface and sub-surface nuclear detonations in the close-in region. This definition of the environment is necessary in order that we may design structures and their contents to remain operational after a nuclear attack.

Research objectives include:

(a) Free Field Phenomena. Theoretical, analytical, and experimental research is required in the following:

1. Behavior of soils, rocks and other media under transient loads.

2. Stress wave propagation in various media to include studies of hydrodynamic, visco-elastic, plastic, elastic and locking behavior.

3. Energy coupling, cratering, ground motion and permanent deformation.

4. Free field air blast in high overpressure region and air blast behavior in tunnels.

(b) Structure - Media Interaction. Continued research is required on structure media-interaction under static and dynamic loading. This should include development of general theoretical relationships as well as experimental work applicable to a variety of structure and media combinations.

(c) Behavior of Structures, Structural Elements and Materials, and Appurtenances. Continued investigation is required on the

behavior of structures, structural elements and materials, and appurtenances. Theoretical and experimental work should include the determination of the response of underground and above ground structures to dynamic loads.

(d) Instrumentation. There is a requirement for continued research to develop instrumentation for the measurement of free-field phenomena, soil structure interaction and structural response. The work should include both the design, development and modernization of instruments as well as techniques for placements.

(e) Effects on Structural Contents. Continued theoretical study is required on the dynamic interaction between equipment and its supports using mathematical models of single and multi-degree of freedom systems, as well as equipment tests on actual weapon systems and components.

(f) Laboratory Facilities and Techniques. A need continues to exist for improved laboratory facilities and techniques to support the experiments required by the foregoing research objectives.

d. BIOMEDICAL. In order to continue combat operations during and after exposure to nuclear detonations, commanders in the field must have knowledge of their effects on personnel. Biomedical investigations are performed, studying the effects of ionizing radiations, thermal radiation, and blast and shock to include initial effects and resultant injuries to these components. Studies of combined effects are correlated with those of individual effects. Since most of the data collected in biomedical programs are on animals of various species, an extrapolation of the data must be made to man. Actual experience on humans is negligible and is primarily obtained as the result of accidents. This information is used wherever possible to help in extrapolation of the data obtained from research on animals.

Research objectives include:

(a) Provide better information on biological trauma resulting from blast and shock effects from explosive detonations.

(b) Determine the parameters of injury produced by thermal radiation divided as follows:

1. Oculo-visual effects - Studies of flashblindness and retinal burns resulting when the eye is exposed to the flash of a nuclear detonation.

2. Miscellaneous studies - Research into the development of protective clothing or devices to reduce the hazard of exposure to thermal radiation.

3. Systemic effects - Investigation into the possible immunological reaction or toxic substances produced in the body when thermal injury is sustained.

(c) Obtain a better understanding of the biological effects of ionizing radiation in man, one of the major casualty producers from nuclear weapons.

(d) Quantification of combined effects - Experimentation designed to evaluate the effects from multiple stress exposure situations.

e. UNDERWATER. Data from the four previous underwater tests have been limited in scope. Areas in which important information is lacking may be listed as follows:

(1) Air Blast - Previous underwater tests have provided only 11 altitude and 8 surface air blast measurements. Theory does not satisfactorily relate HE data with nuclear data. Research and nuclear tests are required to provide an appreciation of the variation of air blast field data with various depths of burst. This is required for safe aircraft delivery ranges and weapon fuzing.

(2) Waves - None of the previous four shots have been detonated at or near the optimum depth for the generation of long period waves. These waves are very destructive and undergo little attenuation with distance traveled. Testing is required to verify and refine existing wave theory and to provide run-up information.

(3) Shock wave propagation in shallow water - The effects of underwater bursts on a harbor configuration are determined to a great extent by the phenomena of surface and bottom reflections. The effects of pressure on piers, underwater pipelines or storage facilities and of cratering on ships, channels cannot be predicted adequately.

(4) Bubble time history as a function of yield and depth of burst - The bubble formation, pulsation, and emigration are important parameters in the determination of radiological hazard from underwater bursts. The development of surface ship delivery tactics for nuclear ASW weapons is dependent on an accurate estimate of this radiological hazard, as a function of yield and depth of burst.

(5) Explosion phenomena in an Arctic region - There are virtually no data on the change in nuclear weapons effects in and over water due to an ice cover of various thicknesses. This subject may become important especially in the field of submarine operations in high latitudes.

(6) Explosions in very deep regions - With the development of operational very deep diving submarines (deeper than 1300 feet), there is a requirement for information on the effects of explosions at various depths against this type target.

Research objectives have been defined as follows:

(a) Determine damage mechanisms, for surface and subsurface targets, from air blast and underwater shock.

(b) Determine damage radii against targets and safety radii for delivery vehicles against nuclear weapons as a function of yield and depth of burst.

(c) Determine mechanism of generation of air blast from underwater bursts as a function of yield and depth of burst.

(d) Determine radius of threshold of injury to personnel from shock motion of ships as a function of yield and depth of burst.

(e) Determine mechanism of generation of water waves as a function of yield and depth of burst or height of burst.

(f) Determine effects of water waves from nuclear explosions on harbors or other land masses.

f. ELECTROMAGNETIC. Some of the larger early atomic tests produced indications of ionospheric disturbances and regions of microwave attenuation. The TEAK and ORANGE tests demonstrated that serious effects on communications could easily be achieved. The ARGUS shots indicated that still other effects could be generated at very high altitudes, outside the atmosphere. Sufficient progress has been made to determine that these phenomena could seriously degrade the effectiveness of many systems depending on or affected by electromagnetic waves, but the amount of real information on which to base numerical predictions of the effects is still painfully, indeed pitifully, inadequate.

(1) Electromagnetic Propagation Effects. Programs are needed to permit and improve prediction of the effects of nuclear detonations upon electromagnetic information links as functions of weapon, location, time, and EM link parameters. Such effects occur principally through disturbance to the medium (atmosphere/ionosphere) through which signals propagate, and the studies concern themselves principally with correlation of the direct effects (ionization, magnetic field disturbance, for example) with the performance of the systems involved (through absorption, refraction, interference, etc.). An additional mode of effect also under investigation is that of electromagnetic energy radiated from the nuclear explosion itself, or from the immediate vicinity as a result of the explosion, as a damage or interference mechanism. "Electromagnetic"

refers here to wavelengths longer than those called "Infrared."

Research objectives include:

(a) Development and maintenance of operational-type models of nuclear explosions and their interactions with their surroundings, so that effects upon EM information links of all sorts may be computed with satisfactory accuracy; the results of such computations to be utilized in the preparation of manuals and other technical literature for the operational users of nuclear weapons effects information. Includes also experimental measurement and theoretical analysis and correlation of the performance of systems (both operational and idealized) under conditions of disturbance ranging from actual nuclear-burst environments through various degrees of artificial and natural perturbation and normal conditions.

(b) Measurement of the size, distribution, intensity, time variation, etc., of regular and irregular variations of the electron density in the upper atmosphere. Such structure is observed both in aurora and in lower latitudes, is expected to arise from nuclear perturbations of the ionosphere, and leads to clutter and interference in high-frequency systems. Measurements are made by special radar techniques and by observation of refraction and dispersion effects on signals propagating through the structured regions.

(c) Exploitation of "old" and unexpected "new" data, through reexamination and reanalysis to extract the most useful information still latent in old weapon-test data and making use of data which exists and becomes available from still unknown or unsuspected sources. Includes also surveys and compilations of literature in specific domains of concern to nuclear weapons effects research.

(d) Optimum use of the natural aurora as a simulation of the nuclear perturbation of the ionosphere, and study of the aurora as a part of the natural background against which EM links function and nuclear weapon effects take place. Studies include microwave scattering, noise measurements, determination of auroral production mechanism, conjugate and correlation studies.

(e) Investigations to use natural ionospheric perturbations or "Sudden Ionospheric Disturbances" (SID), as a simulation of the nuclear explosion effect and to probe the background of natural disturbances. These disturbances are attributed to bursts of X-Rays from solar flares. The simulation and measurement programs investigate High-Frequency (3-30 Mc) absorption, Very-Low-Frequency (3-30 Kc) phase anomalies, Luxembourg (wave-electron gyro-interaction) Effect, and will develop and make use of airborne equipment and a Low-Frequency (50 Kc-3Mc, approximately) ionospheric sounder.

(f) Experimental measurement, analysis, and theoretical development making use of a natural phenomenon in the polar regions which appears to offer the same kind of combination of simulation and natural background study as the aurora and the sudden ionospheric disturbances. These "blackouts" are attributed to the effects of high-energy protons emitted from solar flares and thus are similar in mechanism to some effects of nuclear bursts. Studies include absorption measurements, detailed analysis of performance of scatter communication links, wave-electron gyro-interaction studies, and optical observations of the night sky.

(g) Investigations of propagation of extremely-low-frequency signals, micro-pulsations of the earth's magnetic field, chemical and electronic disturbances of the ionosphere, and other natural and artificial phenomena which appear to simulate the effects of nuclear explosions or to allow analysis and description of the response of the radio propagation medium to various inputs.

(h) Development of instruments which will be needed for full scale nuclear tests at an unspecified future time. So far as possible this has been confined to instruments which will be of value for "basic" and "simulation" type ionospheric research and hence will be developed and used in other programs.

(i) Investigations to establish: The mechanism of generation, the effects and means of protecting against the damage and interference effects, of electromagnetic fields radiated from, or generated transiently very close to, nuclear explosions. Includes compilation and collation of past experience of agencies and persons who have participated in full scale tests and observed this type of effect in any way on any type of equipment, and toward development of a theoretical and computational model which will permit evaluation of the effects in a general way and best direction of future research efforts.

(2) Ionization. Methods are required for the prediction of electron concentration and related geophysical effects at any point in the earth's atmosphere as a result of a high altitude nuclear detonation (above 20 km) of specified yield at any specified location. Includes those basic laboratory and field experiments essential to the determination of such methods and not being sponsored under other auspices.

Research objectives include:

(a) Laboratory determinations of rate for electron attachment, recombination, ion exchange, charge exchange and other chemical processes associated with electron removal in atmospheric gasses, together with radiation absorption and emission properties and thermodynamic properties of the molecular species involved.

(b) Laboratory measurements and computations for determination of motions of the atmosphere in the vicinity of a nuclear burst, to include interaction of the bomb debris with the ambient atmosphere and geomagnetic field, motions induced in the normal ionospheric layers, and long term motion of the fission debris.

(c) Planning of, development of instrumentation for, and conduct of field experiments for in situ measurement of those properties of the atmosphere and geomagnetic field which are essential to the understanding of production of ionization by high altitude detonations, with particular emphasis on natural disturbances of the ionosphere which simulate some of the characteristics of a high altitude nuclear detonation.

(d) Combination of the results of individual research programs to form an over-all model of the phenomenology of high altitude and space detonations of nuclear weapons as relates to production and subsequent disappearance of ionization and to other disturbances of ambient conditions. Development of manual and textbook type material for dissemination of such models. Maintenance of up-to-date plans for measurements in the event nuclear testing is resumed.

g. FALLOUT. Prior to the 1961 Russian test series the United States had detonated 163 nuclear devices ranging in yield by a factor of 750,000 from about 0.02 KT up to about 15,000 KT. However, the majority were tower, air, and balloon shots, and these provided only minimal information on local fallout from land surface bursts. Practically all information on land surface and shallow sub-surface shots is derived from one Nevada surface event and four Pacific surface events. Pacific land surface fallout experiments are most difficult because small islands, coral reefs and shallow lagoons do not represent a true land surface, and the fallout is deposited in the open ocean where measurement and interpretation in terms of a land surface are extremely complex. Our knowledge of water contaminating events is derived, on the most part, from four underwater shots.

Thus, compared to the large number of shots from which other weapons effects information can be derived, local fallout information is derived from a very restricted number of shots.

Some information is on hand concerning land bursts from which the local fallout hazard can be delineated only in the most general terms. The prediction of the precise area of fallout and associated activity levels particularly for high yields cannot be done. This is due to the limited full scale test data upon which to base predictions and because of the difficulties in predicting the varying atmospheric conditions, especially winds. Good radiological measurements for underwater shots were taken for the first time during the two underwater shots of Operation HARDTACK; however, there are still insufficient data to scale with

confidence to other conditions of yield and depth of burst.

For true (contact) surface bursts, of low and moderate yields on land areas, the over-all state-of-knowledge may reasonably be evaluated as fair. More effort has been expended here than for any other burst type both in collection of data and in the development of theoretical models and fallout prediction systems. However, the prediction systems can give strikingly different results when applied to the same situation. One of the major reasons for these changes is the lack of understanding of radioactive fallout particle formation and the early dynamics of these particles in the fireball and rising cloud. A second reason is due to the lack of sufficiently quantitative information with regard to the winds acting on the fallout.

For underground explosions, the state-of-knowledge is poor. It is based on extremely limited test data, on some high explosive data whose relationship to nuclear explosions is not known, and on a very limited theoretical understanding of the physical process of fallout formation and the early dynamics determining their initial distribution in the atmosphere.

Research objectives include: To understand the physical phenomena that govern the production, distribution and deposition of fallout from nuclear detonations. Based upon this knowledge it is then expected that residual effects of nuclear weapons may be accurately predicted; and that these predictions will be used confidently for establishing tactical doctrine and as input for strategic operational analyses. More specifically, this objective includes:

(1) Obtaining radiological effects of underwater and water surface nuclear bursts as a function of yield, depth of burst and depth of water.

(2) Collecting information concerning fallout formation and properties in order to predict the minimum height of burst, crater dose rates, and fallout from very high and very low yield weapons.

(3) Gathering and analyzing data from which the fallout normalization factor may be computed; and showing how this factor is affected by height of burst.

b. THERMAL. Provides for research programs on the capabilities and limitations of all types and yields of fission and fusion nuclear weapons in the field of thermal radiation; and x-radiation emitted by nuclear weapons detonated under near vacuum conditions and the effects of such radiation on missile and space systems in terms of lethality to enemy systems, vulnerability of our own systems, and the countermeasures of hardening possible.

(1) Thermal Radiation. Although a great deal of information has been obtained from both full scale tests and laboratory experiments, adequate explanation of the phenomena remains to be accomplished. For example, the possibility of employing weapons at higher altitudes, with consequently shorter thermal pulses, alters greatly the damage criteria developed for materials.

The "gigaton" problem suggests that very large weapons, detonated at hundreds of kilometers HOB could cause simultaneous ignition and incendiarism over hundreds of thousands of square miles. Such an employment would also be invulnerable to presently foreseen AICBM techniques, even if detected at an early time. For other missiles, for detonation at lower altitudes (20 to 100 km), there is mounting theoretical evidence that a thermo-mechanical effect may be an overriding kill mechanism. Both of these concepts are of fairly recent orgin, and each has potentially profound consequences, so that vigorous pursuit of these new problems is deemed imperative.

Research objectives include: The objectives of the work are to obtain reliable information on the capabilities and limitations of nuclear weapons, when detonated in varying environments, to insure sufficient knowledge in the following areas:

(a) Large Yield Weapons and their Incendiary Effects.

(b) Optical Interference and Fireball Blackout (as related to the detection and penetration-aids problems).

(c) High Flux Effects, including thermo-mechanical kill mechanisms for ICBM's and survivability of hardened sites.

(d) Ignition and Fire-Spread.

(e) Atmospheric Transmissivity, with emphasis on cloudy, overcast, and high albedo environments.

(f) Low flux effects, particularly ignition capabilities of short pulses from weapons with high HOB.

(g) Non-destructive effects for use in detection, decoy-discrimination, etc.

(2) X-Ray. Only two detonations, LOGAN and TEAK, included X-ray programs. Neither test did much more than confirm that the X-ray effect was real and was about the order of magnitude anticipated. Laboratory simulation, by high explosives and pulsed power techniques, has provided considerable data defining and demonstrating the effects on many, but not all, materials of interest. Since these simulation techniques, with one exception, do not reproduce completely the X-ray interaction with

the material of interest, and since they have never been calibrated in a full scale test, all of these data lack reliability. The electron beam simulation technique does simulate substantially the entire interaction but voltage handling limitations now preclude its application to all materials and energies. Moreover, the development of a body of theory to link and extend the simulation data is still in its formative stages. Thus an increase in reliability cannot be obtained on the basis of completely credible theory. The lack of adequate theory is particularly pressing in the area of structural response since generalization from simulation experiments on a few full scale structures and a few simplified structures cannot reliably be extended to the vast number of structural configurations that are possible.

Substantially all of the foregoing applies primarily to intermediate flux levels, that is, those levels which reach or somewhat exceed ICBM kill criteria. For very much higher levels, relevant to extensive hardening, and for very much lower levels, relevant to satellite instrumentation, there is almost no knowledge of X-ray effects. The state of affairs for countermeasures is only slightly better.

Research objectives include:

(a) Studies on X-radiation emitted by nuclear weapons detonated under near vacuum conditions and the effects of such radiation on missile and space systems. This research is in terms of lethality to enemy systems, vulnerability of our own systems, and the countermeasures, or hardening possible.

(b) Investigation of the transport of X-radiation, after interpretation of the source output as a function of weapon and carrier type. The weapon output research will be accomplished by the AEC laboratories.

(c) Conceptual and calculational study of methods for hardening systems to withstand extremely high flux levels of X-radiation.

(d) Investigation of the fluxes, effects and countermeasures now considered much below the level of interest for current ICBM kill but which may become of great interest in connection with space systems. Includes the development of simulation techniques.

(e) Research relevant to the effects of X-rays on current missile systems, that is, at flux levels of the order of 100-10,000 cals/cm^2. This includes extensive machine computations, simulation by existing techniques, and the development of better simulation methods.

(f) Studies directed specifically at the response of structures to X-rays. This covers the development of theory as well as actual simulation on nose cones and typical materials and shapes.

(g) Investigation of means of countering the X-ray effect, including general systems application analyses.

(h) Studies which apply the results of all other X-ray research in terms of the consequences to representative weapons systems. This includes the calculation of system vulnerability and lethal radii. In addition it includes the development of test instrumentation.

(i) Investigations aimed at a basic understanding and improvement of simulation methods, particularly pulsed power systems.

i. INTEGRATED EFFECTS AND PHENOMENA. Studies which are significantly broader than a single Nuclear Weapons Effects Research project, and which consequently go beyond the responsibilities of any one area of project development.

Research objectives include: Providing nuclear weapons effects information in areas of interest in more than one project area.

Subtasks which have been placed in this category to date are listed as follows:

Advanced Neutron Heating Studies

Ion Debris Study

Special Effects

Information Storage Properties of Photographic Emulsions

High Altitude Effects Compendium

Satellite Vulnerability

Integrated Lethal Effects

7. The Nuclear Weapons Effects Test Program proposes specific shots under varying conditions according to the primary purpose of the test. These include:

a. Fiscal Year 1963

Location	Shot	Primary Purpose	Estimated Cc
Overseas (BLUE ROCK)	165 KT - 20 Km (LOG CABIN)*	Determine blast effects on re-entry vehicles	10.0
	1 - 9 MT - 115 Km (RAIL SPLITTER)	Determine X-ray effects on re-entry vehicles and determine ionization effects	20.0
	.4 - 1 MT - 40 - 70 Km	Combined effects on re-entry vehicles	14.0
Underwater Pacific	1 MT - 900 ft. depth in deep water	Water-waves from large yield detonations	1.5
	10 KT - On bottom in water 50 to 70 feet deep	Safe delivery, damage prediction	3.5
	10 KT - Surface in deep water	Water-loaded blast wave, damage prediction	7.3
NTS (SILVER FOX)	40 KT - 500 to 700 feet - balloon	Determine electromagnetic pulse effects	5.2
	20 Tons - HOB: 3 feet	[redacted] Effects Test Investigate effects on tactical operations and military equipment	1.5
	500 Tons - Bomb case one foot above surface - Alluvium-C.1	Geometric Influence of slight height of burst	2.2
	500 Tons - Bomb case with c.g.@ surface - Alluvium-C.2	Geometric Influence of slight height of burst	2.6
	500 Tons - Bomb case 1 ft. below surface - Alluvium-C.3	Geometric Influence of slight depth	2.1
	500 Tons - c.g. @0ft. Dry Rock (basalt) - A.2	Hard Rock Study	3.6
NTS	500 Tons - HOB: 60 $W^{1/3}$	Low yield weapon effects pertinent to tactical operations, HOB scaling for fallout, TREE radiation source	2.0

[redacted]

Location	Shot	Primary Purpose	Estimated C
NTS	20 Tons - HOB: 40 feet	Very low yield weapon effects at tactical HOB, TREE radiation source	2.0
NTS	20 Tons - HOB: 3 feet with structural steel in fireball	Radiation dissociation of structures (AIM application) controlled fallout/scavenging experiment	2.0
			79.5
	Extra Military Expenses of Nuclear Tests		20.5
		Total	100.0

* May be conducted in conjunction with ZEUS/RV Vulnerability Tests

b. Fiscal Year 1964

Location	Shot	Primary Purpose	Estimated C
Overseas (STRONGARM)	1 MT - 100-125 KM [redacted]	Radar Blackout and other effects from clean weapons	6.0
	20 - 30 MT - 100 to 130 KM Altitude	Determine thermal and blast effects from intermediate altitudes down to surface	15.0
	.25-1MT - 1000-2000 KM Altitude	Investigate magnetic disturbances, turbulent ARGUS, Satellite kill mechanism	15.0
Underwater Pacific	20 Tons - 3 shots at scaled depths	Scaled to 10 KT shots for investigation of scaling and amphibious assault clearance	4.0
Unknown	1 MT - Ground Surface	Electromagnetic pulse, fallout, TREE, blast, structure, high pressure region	16.0
NTS (BUCK SKIN)	5 KT -1000 ft. depth- HARD HAT II	Check improved designs based on HARD HAT I	6.0
	5 KT fission yield - surface - Alluvium-E.1	Cratering variations on mass to yield ratio and directed energy design	3.6
	5 KT fission yield - surface - Alluvium-E.2	Cratering variations on mass to yield ratio and directed energy design	2.4

[redacted]

[redacted] DATA

ATOMIC ENERGY [redacted]

Location	Shot	Primary Purpose	Estimated Co
NTS	Subkiloton, [redacted] low fission device, above surface	Phenomenology and effects on tactical targets of significantly different weapons	3.0
To be selected	5 to 10 KT, Low air over dry natural forest	Tree blowdown, thermal effects on forest	3.0
To be selected	1-2 KT - HOB: 0 feet during inclement weather	Fallout phenomenology during inclement weather	3.0
To be selected	10 KT - HOB: ? Dolomite	Production of landslides in dolomite	3.0
			80.0
	Extra Military Expenses of Nuclear Tests		24.0
		Total	104.0

c. Fiscal Year 1965

Location	Shot	Primary Purpose	Estimated Co
Overseas	20 Tons - 60,000 to 100,000 ft. balloon or missile	Determine blast scaling at high altitudes for high mass to yield tactical weapons	3.0
	5-10 KT - 35 Km, Balloon-VHB	Determine blast equivalence at high altitude	7.0
	165 KT - 20 Km - LOG CABIN II	Determine response of hardened R/V's (Integrated nose cone/ warhead) to blast and thermal effects	15.0
Underwater Pacific	10 KT - 215 ft. depth on bottom	Safe delivery for aircraft and ships from radiation and air blast	6.0
	4 Subkiloton shots at varying depths	Scale shots of Wahoo and Wigwam and other correlation shots as required	7.0
	10 KT - 5000 ft. depth in deep water	Damage to deep diving submarines and containment depth of radiological material	7.0

Location	Shot	Primary Purpose	Estimated Co
	1 MT - shallow depth over deep water	Air blast damage to surface ships water-wave generation	6.0
NTS	5 KT - MARSHMALLOW II (Underground or Surface)	Re-entry vehicles, space systems	12.0
Arctic, (Alaska)	20 t - HOB: 150 W 1/3 over ice	Effects of low yield tactical weapon in Arctic	2.0
Arctic, (Alaska)	5-10 KT, Low air burst over ice	Effects of Arctic terrain in blast and thermal phenomenon, scaling	6.0
Arctic, (Alaska)	5-10 KT, Surface burst on ice	Fallout (ice or snow surface, cratering)	6.0
Arctic, (Alaska)	1-2KT - HOB: 15 W 1/3 Permafrost	Cratering and ground shock effects in permafrost	3.0
			80.0
	Extra Military Expenses of Nuclear Tests		27.0
		Total	107.0

d. Fiscal Year 1966

Location	Shot	Primary Purpose	Estimated Co
To be selected	1-2 KT HOB: 100 W 1/3 Inclement weather	Fallout phenomenology during inclement weather - scaling with HOB	3.0
NTS	3 ea 500 t, HOB: 15 feet	Simultaneous detonations of three [redacted]	3.0
NTS	20 Tons - surface soil over-bearing rock	Scaling and calibration for large yield burst in FY 67	3.0
	0.5 to 2 KT - Surface - Soil overbearing rock	Scaling and calibration for large yield burst in FY 67	4.6
	B.1 20 tons - c.g.@ 0 feet Alluvium	Nuclear Scaling at surface	2.5
	B.2 20 tons - 18 ft below surface Alluvium	Nuclear Scaling at depth	1.3

[redacted]

Location	Shot	Primary Purpose	Estimated Co
	D.1 500 tons - 120 feet depth gaseous rock (carbonate)	Contribution of non-condensing gases generated in a carbonate rock medium	1.6
Overseas	20 tons - Surface - wet coral sand	Scaling to effects of CACTUS and LACROSSE shots	1.0
	Follow-up I - high altitude Largest high yield weapons available	Follow-up on data obtained from previous high altitude tests effects on the ground	15.0
	1 MT - about 10^6 Km	Space effects, explore unknown	50.0
			85.0
	Extra Military Expenses of Nuclear Tests		27.0
		Total	112.0

e. Fiscal Year 1967

Location	Shot	Primary Purpose	Estimated Co
NTS	500 Tons - 8 ft below surface - Alluvium-C.4	Geometric influence of slight depth	2.1
	5 KT - MARSHMALLOW III surface or underground	Determine X-ray effects on re-entry vehicles and space systems	12.0
	50 KT - 1500 ft depth - HARD HAT III	Refinement of protective techniques with larger yields and larger duration	8.0
Unknown	Large Yield (1-5 MT) surface-soil overbearing rock	Document air blast phenomena and loading of structures in high pressure	12.0
Overseas	10-40 KT - 100,000 to 115,000 ft - Free Balloon (VH BII)	Determine enhancement of air blast effects at high altitudes as a function of weapon design	3.5
	0.1 - 1 MT at about 100 Km	Directed energy effects [redacted]	10.0
	Follow-up II - high altitude	Dependent on previous high altitude results	10.0

[redacted]

RESTRICTED DATA
[redacted] ENERGY ACT 1954

Location	Shot	Primary Purpose	Estimated C
Underwater Pacific	10 KT at 70 ft depth in deep water	To evaluate bottom effects on air blast and radiation in comparison with 70 ft on bottom shot of 1963	4.0
	3 Subkiloton in Arctic	Determine effects ice, snow in low temperature water	8.0
Underwater	10 MT at Optimum Depth in deep water	For wave generation	5.0
			74.6
	Extra Military Expenses of Nuclear Tests		22.0
		Total	96.6

f. Fiscal Year 1968

Location	Shot	Primary Purpose	Estimated C
Overseas	0.1 - 1 MT - about 100 Km	Directed Energy Effects	10.0
	Follow-up III - High altitude	Dependent on previous high altitude effects tests	20.0
Unknown	1 - 5 MT at 2000-4000 ft. altitude	Blast phenomena and structures	5.0
			35.0
	Extra Military Expenses of Nuclear Tests		21.0
		Total	56.0

DASA SUPPORT OF THE NATIONAL MILITARY CONTROL CENTER

1. DASA, through the DODDAC, proposes to support the National Military Command System as follows:

a. In a pre-attack environment, including limited war, process and maintain operational information of worldwide (U.S., allied, neutral, and enemy) military forces and economic resources. This support is envisaged to include current status of forces and resources of unified and specified commanders. The pre-attack support serves to enhance the capability to carry out the post-attack mission below.

b. In a post-attack environment involving general war, continue the pre-attack type support supplemented by the capability of making near real time indirect nuclear damage assessment in order to reflect the accurate and current status of worldwide forces and resources. (This support includes updating from direct damage reports.) Additionally, the support includes monitoring the state of execution of operational war plans.

c. Expand and enhance the data processing and display capabilities of the existing Alternate Joint War Room complex at the AJCC, on an interim basis pending completion of new building construction presently being proposed; thereafter, to serve as the central data processing and display center for the AJWR.

d. Expand and enhance the data processing and display capabilities of the Joint War Room complex on an interim basis pending establishment of the National Military Command Center some two to three years hence; enhance the present capabilities of the Joint Chiefs of Staff and the Joint Staff to perform their responsibilities and functions in the command and control area.

2. The basic components of this function are:

a. DODDAC Developmental Center (Pentagon). The DODDAC Developmental Center performs several support functions, all of which do not contribute directly to the NMCS. This center responds to numerous Department of Defense agencies (Sec Def), ASD (ISA), ASD (CD), Asst to Sec Def (AE), JCS, Joint Staff, etc.) with studies and analyses of attack hazards and vulnerabilities of worldwide forces and resources. JCS Publication 5, Joint Atomic Weapons Planning Manual, is produced at this center. Data bases of worldwide forces and resources are compiled, collated, and stored; special data bases are compiled to support DODDAC operational elements. Operational reports are received and processed at the Development Center. Mathematical damage assessment models, utility programs, and control programs are prepared at, or under the supervision of, elements of the Developmental Center. Computer support is rendered by a general purpose, solid state, digital computer system consisting of

a main frame and two satellite computers (annual rental $500,000). The computer system is supported by an electric accounting machine facility. The Pentagon center is developing for operational use a semi-automatic full-color display system which will retrieve and display information stored in the computer system (one-time cost $2,000,000). The Developmental Center, with proper augmentation of personnel and money, will provide developmental and operational support to appropriate elements of the NMCS.

b. DODDAC Emergency Capability System (AJCC). The first operational facility of the DODDAC was established and began operation in early July 1961. This facility provides operational damage assessment to JCS elements (Joint Alternate Command Element) in the AJCC. In addition, the ECAP system has a limited capability to provide status of forces and resources to JACE as well as to monitor the status of execution of operational war plans. This system is presently scheduled for increased capability in July 1962 and consequent phase-over into an interim operational capability pending completion of Building D, AJCC. The ECAP System is presently supported by an IBM 1401 computer system (annual rental $160,000). It is planned to expand this emergency operational system to one which will center around a CDC 1604 system which will be supported by the IBM 1401.

c. Alternate Joint War Room Complex. An interim modest expansion of the existing Alternate Joint War Room complex will be accomplished to accommodate data processing facilities and display facilities and equipment to support the Joint Chiefs of Staff and the Secretary of Defense in the command/control and evaluation of national military forces and resources. The establishment of an evolutionary basis will enable the Alternate Joint War Room complex to accept inputs of data from the existing command and control systems of the JCS, Services, CINCs, atomic coordination machinery, and other responsive agencies. Funds are additionally required for shock-mounting of data processing and supplementary equipment which would be utilized during this time period.

d. Joint War Room Complex. An interim modest expansion of the existing Joint War Room complex to accommodate data processing and display facilities and equipment to support the Joint Chiefs of Staff and the Secretary of Defense in the command/control and evaluation of national military forces and resources. The establishment of an electronic data processing facility in the Joint War Room complex which can be expanded on an evolutionary basis will enable the Joint War Room complex to accept inputs of data from the existing command and control systems of the Services, CINCs, atomic coordination machinery, and other responsive agencies.

3. The following should be considered in assigning responsibilities for NMCC:

a. The DODDAC is an approved program (DOD Directive 3020.25 w/changes) which has its present operational application in the Alternate Joint Communications Center (AJCC) in support of the Joint Chiefs of Staff. With the change in concept which dictates an NMCC, there is a natural extension of this operational capability to support the NMCC. The DODDAC system plans to accept, process (computing damage where necessary), retrieve, and present current operational information of worldwide forces and resources. Such support is vital to the decision making process.

b. The present Alternate Joint War Room complex in the AJCC, a primary alternate for national command authority, has limited display and no data processing capability in any way commensurate with or compatible with that embodied by the atomic striking forces which would be provided strategic guidance from such a center. Acquisition of an EDPS capability in the Alternate Joint War Room complex will enable the JCS Joint War Room in the Pentagon and the alternate at the AJCC, to proceed in close harmony towards the development and maintenance of a general war data base which can in turn be provided to the mobile national emergency command posts and appropriate CINCs as interface capabilities develop. Immediate but reasonable expansion of the existing command center is required to accommodate the EDP and display equipment pending the establishment of a fully adequate Alternate National Military Command Center.

c. The present Joint War Room complex, although being efficiently utilized, does not have sufficient space or equipment to adequately fulfill its mission. Immediate but reasonable expansion of the existing display capability as well as the establishment of a data handling capability is required pending the establishment of a fully adequate NMCC. Acquisition of an initial EDPS capability will enable the JCS/JWR complex to interface with several of those above mentioned systems which are presently capable of funneling appropriate information to the JCS but for which no JCS terminal capability exists.

4. The expansion of the DODDAC in both the Pentagon and the AJCC should take place in early FY 63 with the bulk of the effort reaching a peak by the end of FY 63. The evolution will be gradual and will be influenced in succeeding years as necessary to provide optimum support.

5. The expanded program for the National Military Command Center which augments the DODDAC requirement is as follows:

	(Millions of Dollars)					
	FY 63	FY 64	FY 65	FY 66	FY 67	FY
RDT&E	10.900	3.050	4.100	3.250	3.200	3.2
O&M	1.350	4.160	4.304	4.564	4.414	4.4
Procurement		.733		.300		
Military Construction		.150				
Military Personnel	.600	1.016	1.285	1.305	1.305	1.3
TOTAL	12.850/1	9.109	9.689	9.419	8.919	8.9

/1 Not included in DASA program totals since funds (except Military Personnel) were specifically earmarked for this purpose in the Air Force Budget.

6. The requirements to be funded from RDT&E include:

		(Millions of Dollars)					
		FY 63	FY 64	FY 65	FY 66	FY 67	FY
a.	Equipment Development	2.800	-	-	-	-	
b.	System Design	.500	-	.500	-	-	
c.	Computer Services	2.000	1.400	1.400	1.400	1.400	1.4
d.	Display Services	.400	.250	.250	.300	.300	.3
e.	Display Equipment (Semi-Automated)	2.800	-	.500	-	-	
f.	Display Equipment (Manual/Visual)	.700	.200	.250	.300	.300	.3
g.	Operational Reporting (JOPPREP/CAOSOP)	.700	.200	.200	.250	.200	.2
h.	Mobile System Development (Including MNECP Equipment Development and Programming)	1.000	1.000	1.000	1.000	1.000	1.0
		10.900	3.050	4.100	3.250	3.200	3.2

7. Operation and Maintenance requirements are:

		(Millions of Dollars)					
		FY 63	FY 64	FY 65	FY 66	FY 67	FY 68
a.	Computer Rental	-	2.800	2.800	2.800	2.800	2.800
b.	Computer Test and Debug	.200	-	-	-	-	-
c.	Manual	.250	.200	.200	.200	.200	.200
d.	Supplies (Photo, graphics, Electronic Spare Parts, etc.)	.100	.100	.100	.100	.100	.100
e.	Civilian Pay	.200	.250	.300	.350	.350	.350
f.	Administrative Costs	.100	.120	.130	.140	.140	.140
g.	Computer Installation Costs	.500	-	-	.200	-	-
h.	Communication Support		.690	.774	.774	.824	.824
		1.350	4.160	4.304	4.564	4.414	4.414

8. Additional military and civilian personnel will be required:

	FY 63	FY 64	FY 65	FY 66	FY 67	FY 68	FY 69	FY 70	FY 71
Army	47	61	77	79	79	79	79	79	79
Navy	48	61	77	79	79	79	79	79	79
Air Force	48	61	79	79	79	79	79	79	79
Total Military	143	183	233	237	237	237	237	237	237
Civilian	20	20	25	30	35	35	35	35	35
TOTAL	163	203	258	267	272	272	272	272	272

9. Coupled with this proposal are additional requirements imposed by the Joint War Games Control Group ($300,000) and additional computer operating equipment for the present expanded DODDAC Mission ($900,000). These were not included in the Fiscal Year 1963 DASA RDT&E Budget. This increased requirement for both RDT&E and O&M funds will prevail in succeeding years and will be over and above the additional cost of supporting the NMCC.

Section 4

MANPOWER

1. The 15 April 1962 "Five-Year Force Structure and Financial Program" included military costs applicable to DASA. Numbers of personnel and their costs were developed by the Services and did not agree with either the numbers eventually approved for DASA or the costs as computed by DASA. Military personnel costs are computed by DASA on the basis of individual grades chargeable to a particular program element whereas the Services compute on the basis of gross numbers of enlisted or officer spaces authorized for DASA. The Service method is less exact and does not provide data as to individual program element.

2. These differences have been reconciled and the new 15 April 1962 amounts, converted to the new DASA Program Elements are as follows:

a. Personnel authorized for DASA, Fiscal Year 1963-70

	Number	Cost (Millions of Dollars)
Army	2478	$11.9
Navy	1188	6.4
Marine Corps	476	1.4
Air Force	1687	8.2
Total Military Personnel	5829	$27.9
Civilian Personnel	2101	12.4
	7930	$40.3

b. Military Personnel costs by Program Element, Fiscal Year 1963-70

Element	Cost (Millions of Dollars)	
Nuclear Weapons Operations & Training	~~$19.5~~ 19	14.7
Nuclear Weapons Development	.9	9
Nuclear Weapons Effects Research	.7	1.7
Nuclear Weapons Effects Tests	~~2.6~~ 3.6	.8
Damage Assessment	.8	3.5
Command Support	3.4	26.6
	$27.9	

132 JTF-8

3. DASA is proposing increases in its present authorizations. They include the following:

a. When Joint Task Force EIGHT was established the JCS authorized 132 spaces for the JTF-8 Headquarters supplemented with temporary duty personnel. At that time decision on continued testing had not yet been made. Under present guidance DASA and the AEC have programmed a yearly series of tests. In order to support this requirement a permanent Task Force Headquarters of 250 military personnel is programmed for the Fiscal Year 1963-68, as follows:

	Number	Cost (Millions of Dollars)
Army	72	$ .4
Navy	77	.5
Marine Corps	1	-
Air Force	100	.7
	250	$1.6

b. The proposed personnel augmentation of the DODDAC is discussed under the "DASA Support of the National Military Control Center."

PROGRAM SUMMARY

DASA TOTALS

NUMBER PERSONNEL

	1963	1964	1965	1966	1967	1968	1969	1970	1971
Army	2552	2566	2582	2584	2584	2584	2584	2584	2584
Navy	1265	1278	1294	1296	1296	1296	1296	1296	1296
Marine Corps	482	482	482	482	482	482	482	482	482
Air Force	1791	1804	1822	1822	1822	1822	1822	1822	1822
Total Military	6090	6130	6180	6184	6184	6184	6184	6184	6184
Civilian	2121	2121	2126	2131	2136	2136	2136	2136	2136
Total	8211	8251	8306	8315	8320	8320	8320	8320	8320

MILITARY COSTS BY SERVICE
(Millions of Dollars)

	1963	1964	1965	1966	1967	1968
Army	12.3	12.4	12.5	12.5	12.5	12.5
Navy	6.8	6.9	6.9	7.0	7.0	7.0
Marine Corps	1.4	1.4	1.4	1.4	1.4	1.4
Air Force	8.8	8.8	8.9	8.9	8.9	8.9
	29.3	29.5	29.7	29.8	29.8	29.8

MILITARY COSTS BY PROGRAM ELEMENT
(Millions of Dollars)

	1963	1964	1965	1966	1967	1968
Nuclear Weapons Operations & Training	19.1	19.1	19.1	19.1	19.1	19.1
Nuclear Weapons Development	.9	.9	.9	.9	.9	.9
Nuclear Weapons Effects Research	.9	.9	.9	.9	.9	.9
Nuclear Weapons Effects Tests	3.5	3.5	3.5	3.5	3.5	3.5
Damage Assessment	1.5	1.7	1.9	2.0	2.0	2.0
Command Support	3.4	3.4	3.4	3.4	3.4	3.4
	29.3	29.5	29.7	29.8	29.8	29.8

SECRET

SECTION 5

COST PROJECTIONS
BY PROGRAM ELEMENT
FISCAL YEAR 1963 - 1968

SECRET

RESTRICTED DATA
ATOMIC ENERGY ACT 1954

DEFENSE ATOMIC SUPPORT AGENCY

FISCAL YEAR 1963

(IN MILLIONS OF DOLLARS)

		RDT&E	MIL CON	PROC	O & M	MIL PERS	TOTAL
RESEARCH & DEVELOPMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-					-
NUCLEAR WPN DEV	(7 60 04 01 5)	1.5					1.5
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	30.0					30.0
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	100.0					100.0
DAMAGE ASSESSMENT	(7 60 10 01 5)	14.1					14.1
COMMAND SUPPORT	(7 60 20 01 5)	-					-
TOTAL		145.6					145.6
INVESTMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)		1.2	-			1.2
NUCLEAR WPN DEV	(7 60 04 01 5)		-	-			-
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)		1.0	-			1.0
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)		-	-			-
DAMAGE ASSESSMENT	(7 60 10 01 5)		-	-			-
COMMAND SUPPORT	(7 60 20 01 5)		-	-			-
TOTAL			2.2	-			2.2
OPERATING							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)			1.7	15.8	19.1	36.6
NUCLEAR WPN DEV	(7 60 04 01 5)			-	.2	.9	1.1
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)			-	.2	.9	1.1
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)			-	.2	3.5	3.7
DAMAGE ASSESSMENT	(7 60 10 01 5)			-	3.1	1.5	4.6
COMMAND SUPPORT	(7 60 20 01 5)			-	3.1	3.4	6.5
TOTAL				1.7	22.6	29.3	53.6
ELEMENT TOTAL							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-	1.2	1.7	15.8	19.1	37.8
NUCLEAR WPN DEV	(7 60 04 01 5)	1.5	-	-	.2	.9	2.6
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	30.0	1.0	-	.2	.9	32.1
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	100.0	-	-	.2	3.5	103.7
DAMAGE ASSESSMENT	(7 60 10 01 5)	14.1	-	-	3.1	1.5	18.7
COMMAND SUPPORT	(7 60 20 01 5)	-	-	-	3.1	3.4	6.5
GRAND TOTAL		145.6	2.2	1.7	22.6	29.3	201.4

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ATOMIC [redacted] 1954

DEFENSE ATOMIC SUPPORT AGENCY
FISCAL YEAR 19 64

(IN MILLIONS OF DOLLARS)

		RDT & E	MIL CON	PROC	O & M	MIL PERS	TOTAL
RESEARCH & DEVELOPMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-					-
NUCLEAR WPN DEV	(7 60 04 01 5)	1.4					1.4
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	55.3					55.3
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	104.0					104.0
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.2					6.2
COMMAND SUPPORT	(7 60 20 01 5)	-					-
TOTAL		166.9					166.9
INVESTMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)		1.6	-			1.6
NUCLEAR WPN DEV	(7 60 04 01 5)		-	-			-
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)		1.2	-			1.2
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)		-	-			-
DAMAGE ASSESSMENT	(7 60 10 01 5)		.2	.7			.9
COMMAND SUPPORT	(7 60 20 01 5)		-	-			-
TOTAL			3.0	.7			3.7
OPERATING							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)			3.6	15.8	19.1	38.5
NUCLEAR WPN DEV	(7 60 04 01 5)			-	.2	.9	1.1
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)			-	.3	.9	1.2
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)			-	.2	3.5	3.7
DAMAGE ASSESSMENT	(7 60 10 01 5)			-	6.4	1.7	8.1
COMMAND SUPPORT	(7 60 20 01 5)			-	3.2	3.4	6.6
TOTAL				3.6	26.1	29.5	59.2
ELEMENT TOTAL							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-	1.6	3.6	15.8	19.1	40.1
NUCLEAR WPN DEV	(7 60 04 01 5)	1.4	-	-	.2	.9	2.5
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	55.3	1.2	-	.3	.9	57.7
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	104.0	-	-	.2	3.5	107.7
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.2	.2	.7	6.4	1.7	15.2
COMMAND SUPPORT	(7 60 20 01 5)	-	-	-	3.2	3.4	6.6
GRAND TOTAL		166.9	3.0	4.3	26.1	29.5	229.8

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DEFENSE ATOMIC SUPPORT AGENCY
FISCAL YEAR 19 65

(IN MILLIONS OF DOLLARS)

		RDT&E	MIL CON	PROC	O & M	MIL PERS	TOTAL
RESEARCH & DEVELOPMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-					-
NUCLEAR WPN DEV	(7 60 04 01 5)	1.4					1.4
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	52.6					52.6
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	107.0					107.0
DAMAGE ASSESSMENT	(7 60 10 01 5)	7.2					7.2
COMMAND SUPPORT	(7 60 20 01 5)	-					-
TOTAL		168.2					168.2
INVESTMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)		3.2	-			3.2
NUCLEAR WPN DEV	(7 60 04 01 5)		-	-			-
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)		.2	-			.2
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)		-	-			-
DAMAGE ASSESSMENT	(7 60 10 01 5)		-	-			-
COMMAND SUPPORT	(7 60 20 01 5)		-	-			-
TOTAL			3.4	-			3.4
OPERATING							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)			3.4	16.0	19.1	38.5
NUCLEAR WPN DEV	(7 60 04 01 5)			-	.2	.9	1.1
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)			-	.3	.9	1.2
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)			-	.2	3.5	3.7
DAMAGE ASSESSMENT	(7 60 10 01 5)			-	6.7	1.9	8.6
COMMAND SUPPORT	(7 60 20 01 5)			-	3.2	3.4	6.6
TOTAL				3.4	26.6	29.7	59.7
ELEMENT TOTAL							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-	3.2	3.4	16.0	19.1	41.7
NUCLEAR WPN DEV	(7 60 04 01 5)	1.4	-	-	.2	.9	2.5
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	52.6	.2	-	.3	.9	54.0
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	107.0	-	-	.2	3.5	110.7
DAMAGE ASSESSMENT	(7 60 10 01 5)	7.2	-	-	6.7	1.9	15.8
COMMAND SUPPORT	(7 60 20 01 5)	-	-	-	3.2	3.4	6.6
GRAND TOTAL		168.2	3.4	3.4	26.6	29.7	231.3

DEFENSE ATOMIC SUPPORT AGENCY
FISCAL YEAR 19 66

(IN MILLIONS OF DOLLARS)

		RDT&E	MIL CON	PROC	O & M	MIL PERS	TOT
RESEARCH & DEVELOPMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-					
NUCLEAR WPN DEV	(7 60 04 01 5)	1.1					
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	47.2					4
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	112.0					11
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.3					
COMMAND SUPPORT	(7 60 20 01 5)	-					
TOTAL		166.6					16
INVESTMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)		1.1	-			
NUCLEAR WPN DEV	(7 60 04 01 5)		-	-			
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)		.8	-			
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)		-	-			
DAMAGE ASSESSMENT	(7 60 10 01 5)		-	-			
COMMAND SUPPORT	(7 60 20 01 5)		-	-			
TOTAL			1.9	-			
OPERATING							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)			6.3	16.0	19.1	4
NUCLEAR WPN DEV	(7 60 04 01 5)			-	.2	.9	
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)			-	.3	.9	
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)			-	.2	3.5	
DAMAGE ASSESSMENT	(7 60 10 01 5)			.3	7.1	2.0	
COMMAND SUPPORT	(7 60 20 01 5)			-	3.1	3.4	
TOTAL				6.6	26.9	29.8	6
ELEMENT TOTAL							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-	1.1	6.3	16.0	19.1	4
NUCLEAR WPN DEV	(7 60 04 01 5)	1.1	-	-	.2	.9	
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	47.2	.8	-	.3	.9	4
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	112.0	-	-	.2	3.5	11
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.3	-	.3	7.1	2.0	1
COMMAND SUPPORT	(7 60 20 01 5)	-	-	-	3.1	3.4	6
GRAND TOTAL		166.6	1.9	6.6	26.9	29.8	231

DEFENSE ATOMIC SUPPORT AGENCY
FISCAL YEAR 19 67

(IN MILLIONS OF DOLLARS)

		RDT&E	MIL CON	PROC	O & M	MIL PERS	TOTAL
RESEARCH & DEVELOPMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-					-
NUCLEAR WPN DEV	(7 60 04 01 5)	1.0					1.0
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	46.1					46.1
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	98.6					98.6
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.3					6.3
COMMAND SUPPORT	(7 60 20 01 5)	-					-
TOTAL		152.0					152.0
INVESTMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)		.7	-			.7
NUCLEAR WPN DEV	(7 60 04 01 5)		-	-			-
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)		.5	-			.5
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)		-	-			-
DAMAGE ASSESSMENT	(7 60 10 01 5)		-	-			-
COMMAND SUPPORT	(7 60 20 01 5)		-	-			-
TOTAL			1.2	-			1.2
OPERATING							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)			4.4	16.1	19.1	39.6
NUCLEAR WPN DEV	(7 60 04 01 5)			-	.2	.9	1.1
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)			-	.3	.9	1.2
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)			-	.2	3.5	3.7
DAMAGE ASSESSMENT	(7 60 10 01 5)			-	6.9	2.0	8.9
COMMAND SUPPORT	(7 60 20 01 5)			-	3.1	3.4	6.5
TOTAL				4.4	26.8	29.8	61.0
ELEMENT TOTAL							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-	.7	4.4	16.1	19.1	40.3
NUCLEAR WPN DEV	(7 60 04 01 5)	1.0	-	-	.2	.9	2.1
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	46.1	.5	-	.3	.9	47.8
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	98.6	-	-	.2	3.5	102.3
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.3	-	-	6.9	2.0	15.2
COMMAND SUPPORT	(7 60 20 01 5)	-	-	-	3.1	3.4	6.5
GRAND TOTAL		152.0	1.2	4.4	26.8	29.8	214.2

DEFENSE ATOMIC SUPPORT AGENCY
FISCAL YEAR 19 68

(IN MILLIONS OF DOLLARS)

		RDT & E	MIL CON	PROC	O & M	MIL PERS	TOTAL
RESEARCH & DEVELOPMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-					-
NUCLEAR WPN DEV	(7 60 04 01 5)	1.0					1.0
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	43.9					43.9
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	56.0					56.0
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.3					6.3
COMMAND SUPPORT	(7 60 20 01 5)	-					-
TOTAL		107.2					107.2
INVESTMENT							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)		.7	-			.7
NUCLEAR WPN DEV	(7 60 04 01 5)		-	-			-
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)		.3	-			.3
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)		-	-			-
DAMAGE ASSESSMENT	(7 60 10 01 5)		-	-			-
COMMAND SUPPORT	(7 60 20 01 5)		-	-			-
TOTAL			1.0	-			1.0
OPERATING							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)			3.7	15.9	19.1	38.7
NUCLEAR WPN DEV	(7 60 04 01 5)			-	.2	.9	1.1
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)			-	.3	.9	1.2
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)			-	.2	3.5	3.7
DAMAGE ASSESSMENT	(7 60 10 01 5)			-	6.9	2.0	8.9
COMMAND SUPPORT	(7 60 20 01 5)			-	3.2	3.4	6.6
TOTAL				3.7	26.7	29.8	60.2
ELEMENT TOTAL							
NUCLEAR WPN OP & TNG	(7 60 02 01 5)	-	.7	3.7	15.9	19.1	39.4
NUCLEAR WPN DEV	(7 60 04 01 5)	1.0	-	-	.2	.9	2.1
NUCLEAR WPN EFF RSCH	(7 60 06 01 5)	43.9	.3	-	.3	.9	45.4
NUCLEAR WPN EFF TESTS	(7 60 08 01 5)	56.0	-	-	.2	3.5	59.7
DAMAGE ASSESSMENT	(7 60 10 01 5)	6.3	-	-	6.9	2.0	15.2
COMMAND SUPPORT	(7 60 20 01 5)	-	-	-	3.2	3.4	6.6
GRAND TOTAL		107.2	1.0	3.7	26.7	29.8	168.4